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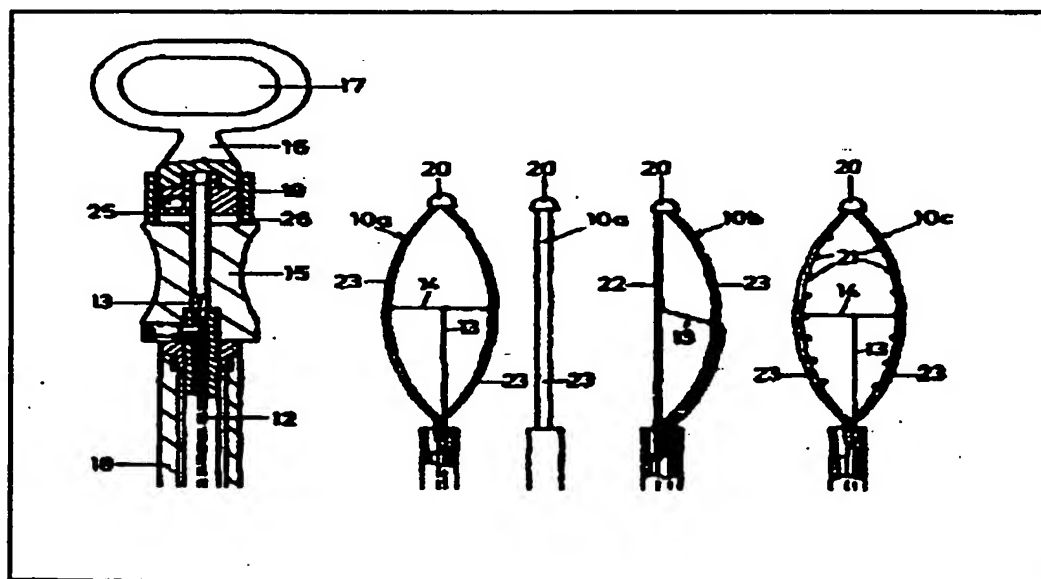
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## Utility Patent G 87 07 515 U1

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Summary: None given.



**"An apparatus for capture and removal of  
foreign objects from bodily internals"**

**CLAIMS**

Claimed is:

1. An apparatus for the capture and removal of foreign objects from bodily internals, essentially being comprised of a loop, which can be withdrawn into a tube and an activation means, whereby the said loop, by the action of its inherent elasticity opens when in the emergent condition, therein characterized, in that an additional pull-wire (13) is available for the closing of the loop (10, 10a, 10b, 10c) in its emergent condition.
2. An apparatus in accord with Claim 1, therein characterized, in that the loop (10) in its emergent condition possesses essentially the shape of an oval (10a, 10c).
3. An apparatus in accord with Claim 1, therein characterized, in that the loop (10) in its emergent condition possesses essentially the shape of a circle (10b).
4. An apparatus in accord with Claim 3, therein characterized, in that the secant (22) is constructed more rigidly than the circular arcs (23) and an end of the circular arc (23) is longitudinally slidable relative to the secant (22).

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5. An apparatus in accord with one of the Claims 1 to 4, therein characterized, in that the pull-wire (13) is tensionably connected in the center of a crosstie wire (14) between the two loop partitions and distorts these under tension into a V-shape, and further in that the two parts of the crosstie wire (14) and the corresponding pull-wire (13) assume a Y-shape.

6. An apparatus in accord with Claim 4, therein characterized, in that the pull-wire (13) is fastened to the secant (22) and said pull-wire is led therefrom to the circular arc (23) at an angle in relation to said secant of less than  $90^\circ$  and at the circular arc (23) is led through a corresponding opening as well as along the said circular arc (23) and into the tube (11).
7. An apparatus in accord with one of the Claims 1 to 6, therein characterized, in that the loop of itself (10) is comprised of ribbon shaped, flat material.
8. An apparatus in accord with one of the Claims 1 to 7, therein characterized, in that the inner surface of the loop (10) is coated with a slip resistant material.
9. An apparatus in accord with one of the Claims 1 to 8, therein characterized, in that the inner surface of the loop (10) is equipped with small projections.
10. An apparatus in accord with one of the Claims 1 to 9, therein characterized, in that the activation device is comprised of: a containing support (18), a first handgrip (15) component slidable in the longitudinal direction of said support (18) and a second handgrip (16) longitudinally slidable in relation to the said support (18) and to the first handgrip (15).

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11. An apparatus in accord with Claim 10, therein characterized, in that the second handgrip (16) is provided with a ring.
12. An apparatus in accord with Claim 10 or 11, therein characterized, in that the second handgrip (16) and a spacer sheath (19) allotted thereto are threadedly engaged, one with the other and the excess length portion (26) thereof is variable by relative turning.

13. An apparatus in accord with one of the Claims 1 to 12, therein characterized, in that the free end of the loop (10) is provided with a rounded off cover cap (20).
14. An apparatus in accord with Claim 13, therein characterized, in that the said cover cap (20) possesses somewhat the shape of a hemisphere, the circular base of which corresponds to the cross-section of the tube 11.

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### DESCRIPTION

The invention is concerned with an apparatus for the capture and removal of foreign objects in accord with the generic concept of the Claim 1.

The German Patent 2 132 808 brings into common knowledge an apparatus for the removal of growths, preferably in the intestinal tract. The said apparatus is marked by a wire loop which is affixed to an end of a sliding loop carrier proximal to the growth to be removed. The said carrier is longitudinally movable in the boring of a longitudinal sliding guide. The wire loop is springingly designed, so that, upon emergence from the restriction of the longitudinal sliding guide it assumes somewhat the shape of an oval. In this form it can capture and cut-off the said growth.

Apparatuses of this kind are also made known by DE-ASen 10 24 202 and DE 10 32 474. These apparatuses exhibit respectively an instrument passage, in which a longitudinal sliding guide designed for instrument carrying possesses on its forward end a cutting loop which is moved axially. The cutting loop, which is comprised of wires, is laid over the growth to be removed. Then, after connection to a source of voltage, the said loop can be drawn together as a result of simultaneous axial movement of the instrument carrier and the growth can be removed without loss of blood, in the manner of an electrical knife.

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The rigidly designed apparatus, the shaft of which possesses a relatively large diameter, makes possible observations and operations to a certain depth.

In the case of the last named apparatus, the loop can never be fully drawn together nor even withdrawn into the instrument carrier, because either the wire would break or undergo a permanently remaining deformation. On this account, a definite minimum opening of the loop cross-section must held to and the final resection of the growth effected by the axial movement of the instrument carrier.

These apparatuses are not well suited for the capture and removal of foreign objects from bodily interiors, since every narrowing of the loop opening is simultaneously accompanied by a push of the said loop. From this can arise an undesired pushing of the foreign object deeper into the body, before the foreign object has been securely seized by the loop. The result thereof, is often damage to the interior of the bodily passages.

Thus, the invention has the purpose of creating an apparatus for the capture and removal of foreign bodies from bodily interiors, in which the loop can be pulled-up without changing its basic position.

The achievement of this purpose is accomplished in accord with the invention by the features of Claim 1.

Advantageous developments are evident from the subordinate Claims.

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The invention will be described in the following using references to the embodiment shown in the single illustrative figure. In the case of the depicted loops 10a, 10b and 10c, we are concerned with:

- two with the shape of two circular segments combined, 10a
- one with the shape of a circular segment 10b and
- one with the shape of two circular segments with which the inner surfaces are provided with additional projections 10c.

In addition, a side view of any of the loops is shown.

However, it has been shown as disadvantageous, to capture, retain and to remove, as has been done up to this point, the solid object by means of the insertion of the loop 10, i.e 10a or 10c.

Upon the insertion of the loop 10, that is 10a, 10b or 10c, simultaneously there is a change in the basic position of said loop 10, through which, involuntarily occurs a sliding of the foreign object to be removed and thereby a damaging trauma in the interior of the bodily passageway. Thus it is necessary, to seize the foreign object while maintaining the basic position of the loop 10. This is effected by means of a pull-wire 13, in some cases with the help of an additional crosstie 14. Both the pull-wire 12 as well as the pull-wire 13 are connected in the tube 11 with an activation device, wherein the pull-wire 12 is connected with a first handgrip 15 and the pull-wire 13 with a second handgrip 16 with a complementary ring 17. The first handgrip 15 and the second handgrip 16 are longitudinally slidable relative to a hollow cylinder 15 and thereby act to retract the loop 10 into the tube. By means of the relative longitudinal sliding of the second handgrip 16 in relation to the first handgrip 15, the pull-wire 13 is retracted, at the same time, the basic position of the loop 10 in the tube is maintained.

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This leads to a tightening of loop opening either directly as in the case of the loop 10b, or indirectly by means of the crosstie wire 14 as in the case of the loops 10a and 10c.

This tightening assures a secure retention in the loop 10 of the previously seized foreign object. In order to obtain a sensitive and simultaneous closure of the loop 10, the relative movement between the second handgrip 16 and the first handgrip 15 can occur over a spacer sheath 19, which is threadedly connected with the second handgrip 16. By means of relative turning between the second handgrip and the spacer sheath 19, the length of the excess portion 26 of the spacer sheath can be changed. Along with this change, the relative position of the second handgrip to the first handgrip 15 is also altered. The free end of the loop is advantageously provided with a rounded cover cap 20, in order to prevent a situation in which upon retraction of the loop 10 any bodily elements are subjected to trauma. This cover cap 20 can have the shape of a hemisphere, the circular base surface of which corresponds to the cross-section surface of the tube 11, so that, in the retracted condition, the loop 10 possesses stepless transition from tube 11 to the cover cap 20. The said loop can be comprised of a flat, ribbon shaped material.

The flat, ribbon shape of the loop increases the surface with which the foreign object is to be seized. Moreover, it has shown itself to be advantageous, to provide the inner surface of said loop with a slip-resistant material and/or with projections 21 which in like manner can prevent an unwanted movement of the foreign object in the loop.

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In case of need, in addition a frictional, arresting coating can be applied to the ribbon like material of the loop 10 as well as to the projections 21. The projections 21 can also be comprised of a frictional material. In certain situations, the use of an activation of the pull-wire 13 can be eliminated, since the foreign object is then securely held in the loop 10 and upon retraction of the loop 10 from the body interior, cannot escape from the said loop.

In the case of a loop 10b with a circular segment shaped formation, it is advantageous to design the secant 22 stiffer than the circular arc 23, so that by a pulling back of the pull-wire 13 alone, the circular arc distorts, while the secant remains in place. In such a case, the circular arc 23 is only made fast to the secant on one side, while the distal end of the circular arc 23 is slidable in longitudinal direction relative to the secant 22. By drawing in the pull-wire 13, the circular arc flattens itself and approaches more and more the secant 22, until the foreign body is securely held between the secant 22 and the circular arc 23. In this situation the loop 10 can be retracted as far as possible into the tube.

In the case of the loops 10a and 10c, an additional crosstie wire 14 is provided which tying itself between the two circular arcs 23 and at the same time controlling the extent of the largest opening of the loop 10a or 10c. Vertically to the crosstie wire 14 and approximately in the middle thereof is connected the pull-wire 13. Upon retracting the pull-wire 13 into the tube 11, the crosstie wire distorts into a V-shape, so that the combination of the crosstie wire 14 and the pull-wire 13 together appears in a Y-shape.

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By this means, the two circular arcs 23 are brought together, until the foreign object between them is securely confined.



In this context, the loops 10a or 10c can be withdrawn into the tube as far as the captured foreign object will permit.

The relative movement of the pull-wire 13 is effected by a relative movement of the second handgrip 16 in relation to first handgrip 15 and both in relation to the hollow cylinder 10. In order to make this procedure more sensitive and surer, a spacer sheath 19 can be provided, which is threadedly engaged with the second handgrip by a threading 25. By means of a relative turning between the spacer sheath 19 and the second handgrip 16, the length of the excess extension 26 of the spacer sheath 19 be changed. Therewith is also a change made in the emergent length of the pull-wire 13 out of the tube 11, but conserving unchanged the basic position of the loop 10.

The tube 11 can be equipped with a Luer-Connection, in order to clean aid tube and to disinfect it.

The function of the above described apparatus is as follows:

In the withdrawn condition of the loop 10, the tube 11 is inserted into the critical site in the body. This can also be done in the instrument passage of an endoscope and if required with X-ray screen monitoring. As soon as the desired position is attained, the loop 10 is pushed out of the tube 11 and, as seen by X-ray monitoring or by the endoscope, the capture of the foreign object in the loop 10 is observed.

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If the foreign object is caught in the loop 10, then, by means of the second handgrip 16 — if necessary with the help of the spacer sheath 19 — the pull-wire is tightened and thereby the cross-section of the loop 10 becomes smaller, until the foreign object is securely held. Subsequently, by means of the first handgrip 15 the loop 10 is retracted as far into the tube 11 as is permitted by the foreign object and at that point the extraction of the said foreign object from the body interior begins and is carried out in the conventional manner.

*[This completes the translation of G 87 37 515]*

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